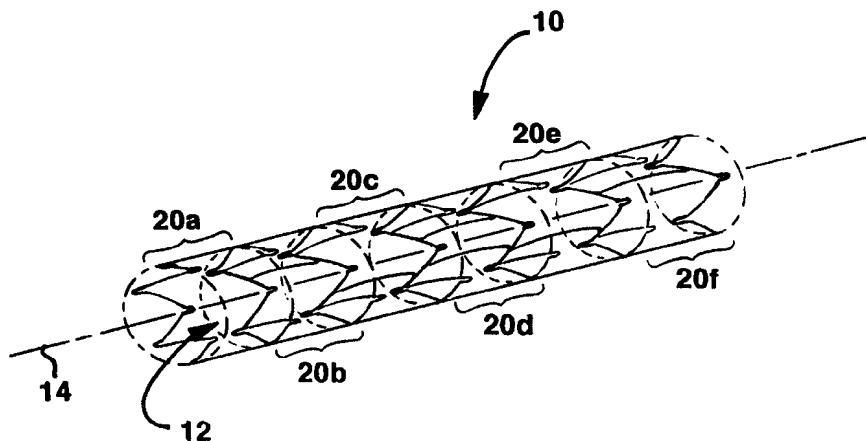




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(21) International Application Number: PCT/US99/02453 (22) International Filing Date: 5 February 1999 (05.02.99) (30) Priority Data: 09/019,210 5 February 1998 (05.02.98) US (71) Applicant: MEDTRONIC, INC. [US/US]; 7000 Central Avenue, N.E., Minneapolis, MN 55432 (US). (72) Inventors: WOLINSKY, Lone; Apartment 29, 75B Herzi Street, 52443 Ramat Gan (IL). LOSHAKOVE, Amir; P.O. Box 204, 42860 Moshav Burgata (IL). NATIV, Ofer; I.L. Peretz 15, 75209 Rishon LeZion (IL). (74) Agent: RAASCH, Kevin, W.; Mueting, Raasch & Gebhardt, P.A., P.O. Box 581415, Minneapolis, MN 55458-1415 (US).		(81) Designated States: JP, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i> (88) Date of publication of the international search report: 28 October 1999 (28.10.99)

(54) Title: RADIALLY-EXPANDABLE STENT AND DELIVERY SYSTEM



(57) Abstract

The present invention provides radially-expandable stents that, in various embodiments, may reduce the bending stresses/strains associated with the compressed state of self-expanding stents and/or may prevent longitudinal expansion/contraction of radially expandable stents between the compressed and expanded states. In addition, stents according to the present invention preferably exhibit increased longitudinal flexibility in both the compressed and expanded states. Furthermore, stents that include circumferential support sections with varying longitudinal lengths and/or varying unrestrained expanded diameters are also disclosed. Also disclosed are stents that provide controllable expansive force profiles. The present invention also includes delivery systems in which threading of the guidewire through the delivery system may be simplified. In addition, the delivery systems according to the present invention may also incorporate a balloon to assist in radially expanding the stent and/or seating of the stent in the lumen during deployment without removing the stent delivery catheter. Further, the delivery systems may also include a support tube at the proximal end to assist in fixing the position of the stent relative to a guide catheter during deployment of the stent.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 99/02453

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: A61F 2/06 // A61M 25/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: A61F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0818184 A1 (B. BRAUN CELSA), 14 January 1998 (14.01.98), column 3, line 36 - column 4, line 12; column 6, line 43 - column 7, line 5, figures 1-2, 12	1-20
A	--	36-52
X	WO 9415549 A1 (SCHNEIDER (USA)INC.), 21 July 1994 (21.07.94)	21-27, 34-35
A	--	28-33

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

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Date of the actual completion of the international search

26 July 1999

Date of mailing of the international search report

15.09.1999

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LEIF BRANDER

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 99/02453

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9641592 A1 (BARD GALWAY LIMITED), 27 December 1996 (27.12.96), page 7, line 11 - page 10, line 13, figures 1-3 -- -----	1-20, 36-52

INTERNATIONAL SEARCH REPORT

national application No.

PCT/US 99/ 02453

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☒ Claims Nos.: 53-64
because they relate to subject matter not required to be searched by this Authority, namely:
Rule 39.1(iv) PCT - Method for treatment of the human or animal body by surgery or therapy
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

Claims 1-20: A radially expandable stent with mid point-attached struts.
Claims 21-35: A delivery system.
Claims 36-52: A radially expandable stent with different portions.

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☒ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
☐ No protest accompanied the payment of additional search fees.

SA 23844

INTERNATIONAL SEARCH REPORT

Information on patent family members

01/07/99

International application No.

PCT/US 99/02453

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0818184 A1	14/01/98	FR 2750853 A,B US 5897589 A	16/01/98 27/04/99
WO 9415549 A1	21/07/94	CA 2149887 A DE 9321003 U EP 0676936 A JP 8500757 T US 5690644 A	21/07/94 10/08/95 18/10/95 30/01/96 25/11/97
WO 9641592 A1	27/12/96	AU 5675196 A AU 5776696 A CA 2223479 A CA 2223502 A EP 0830108 A EP 0830109 A IL 122202 D IL 122203 D IT 1283328 B IT B0950292 A WO 9641591 A IT 1285898 B IT B0960201 A IT 1285899 B IT B0960202 A	09/01/97 09/01/97 27/12/96 27/12/96 25/03/98 25/03/98 00/00/00 00/00/00 16/04/98 09/12/96 27/12/96 26/06/98 15/10/97 26/06/98 15/10/97